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| APPLICATION NO.                                                                                                      | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|----------------------------------------------------------------------------------------------------------------------|-------------|----------------------|---------------------|------------------|
| 10/708,904                                                                                                           | 03/31/2004  | Ko-Hsing Chang       | 12694-US-PA         | 2903             |
| 31561                                                                                                                | 7590        | 09/15/2005           | EXAMINER            |                  |
| JIANQ CHYUN INTELLECTUAL PROPERTY OFFICE<br>7 FLOOR-1, NO. 100<br>ROOSEVELT ROAD, SECTION 2<br>TAIPEI, 100<br>TAIWAN |             |                      | TOLEDO, FERNANDO L  |                  |
|                                                                                                                      |             |                      | ART UNIT            | PAPER NUMBER     |
|                                                                                                                      |             |                      | 2823                |                  |

DATE MAILED: 09/15/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

|                              |                                |                              |  |
|------------------------------|--------------------------------|------------------------------|--|
| <b>Office Action Summary</b> | Application No.<br>10/708,904  | Applicant(s)<br>CHANG ET AL. |  |
|                              | Examiner<br>Fernando L. Toledo | Art Unit<br>2823             |  |

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 31 March 2004.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 8-18 is/are allowed.
- 6) ☒ Claim(s) 1-7 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 31 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☒ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |                                                                                                                                               |                                                                                         |
|-----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                                                   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                                          | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>20040331</u> . | 6) <input type="checkbox"/> Other: _____                                                |

## DETAILED ACTION

### *Specification*

1. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

### *Claim Rejections - 35 USC § 102*

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1, 3 – 7 are rejected under 35 U.S.C. 102(e) as being anticipated by Yoo et al. (U. S. Patent 6,835,621 B2).
4. In re claim 1, Yoo, in the U. S. Patent 6,835,621 B2; figures 1 – 5 and related text, discloses forming a bottom dielectric layer 213 on a substrate 200; forming a charge trapping layer 215 on the bottom dielectric layer; patterning the charge trapping layer, for forming a trench exposing a portion of the bottom dielectric layer (Figure 4); forming a top dielectric layer 219 over the substrate, covering the charge trapping layer and the exposed bottom dielectric layer; forming a conductive layer 240 over the substrate, covering the top dielectric layer; patterning the conductive layer, the top dielectric layer, the charge trapping layer and the bottom dielectric layer, for forming a stacked structure, wherein a width of the stacked structure is larger than a

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width of the trench (Figure 5); and forming source/drain regions in the substrate adjacent to edges of the stacked structure (Column 4, Lines 35 – 39).

5. In re claim 3, Yoo discloses wherein the step of patterning the conductive layer, the top dielectric layer, the charge trapping layer and the bottom dielectric layer includes aligning the trench to a center of the stacked structure (Figure 5).

6. In re claim 4, Yoo discloses wherein the step of forming the bottom dielectric layer includes forming a silicon oxide layer on a surface of the substrate by a thermal oxidation process (Column 3, Lines 15 – 20).

7. In re claim 5, Yoo discloses wherein the step of forming the charge-trapping layer includes forming a silicon nitride layer on the bottom dielectric layer by a chemical vapor deposition process (Column 3, Lines 20 – 25).

8. In re claim 6, Yoo discloses wherein the material of the conductive layer includes polysilicon (Column 4, Line 18).

9. In re claim 7, Yoo discloses wherein the material of the charge-trapping layer is selected from a group consisting of silicon nitride, tantalum oxide,  $\text{SrTiO}_3$ , and hafnium oxide (Column 3, Lines 15 – 20).

### ***Claim Rejections - 35 USC § 103***

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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11. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yoo as applied to claims 1, 3 – 7 above, and further in view of Wolf (Silicon Processing for the VLSI Era Volume 2: Process Integration).

12. In re claim 2, Yoo does not teach forming LDDs or sidewall spacers.

However, Wolf, in the textbook, Silicon Processing for the VLSI Era Volume 2: Process Integration discloses that to overcome hot-carrier effects that degrade the devices LDDs must be used. Sidewall spacers will aid in forming self-aligned source and drain regions for the device (page 354).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to form LDDs in the invention of Yoo, since as taught by Wolf they overcome the hot-carrier effect that degrade the devices, also the use of sidewall spacers will aid in the formation of self-aligned source and drain regions.

#### ***Allowable Subject Matter***

13. Claims 8 – 18 are allowed over the prior art of record.

14. The following is a statement of reasons for the indication of allowable subject matter:

Yoo substantially discloses the claimed invention. Yoo does not teach, suggest or disclose “forming several of first spacers on sidewall of the first trench; using the first spacers as an etching mask and etching the first top dielectric layer and the charge trapping layer for forming a second trench; removing the spacers.” It would be improper hindsight to argue that Yoo can be modified into having sacrificial spacers inside the trench.

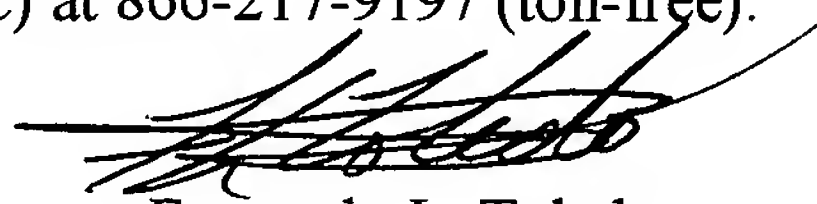
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*Conclusion*

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Fernando L. Toledo whose telephone number is 571-272-1867. The examiner can normally be reached on Mon-Thu 7am to 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on 571-272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Fernando L. Toledo  
Examiner  
Art Unit 2823

flt  
13 September 2005